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19 June 1962

MEMORANDUM FOR: THE RECORD

SUBJECT : APQ-93 Radar, System Evaluation
and Review

1. The resolution of the system is the area of major concern at the present time. The original goal for resolution was to achieve a six-foot by six foot cell. Present resolution elements are five to ten times greater than this value.

2. Four areas of the system control the resolution.

- a. Transmitter-receiver. The resolution of this portion of the system is controlled by the transmitted pulse-width and the receiver bandwidth characteristics. In the present equipment, these characteristics are amenable to the six-by-six foot resolution. However, the transmitter in the flight-test configuration cannot meet the power output necessary for the signal-to-noise and range requirements.
- b. Aircraft motion compensation. The flight instabilities of the flight-test aircraft are greater than were anticipated in the equipment design. The correction of the deficiencies in this area is feasible thru engineering design.
- c. Recorder. The major limitation on resolution is in the recorder system. The original concept required an equivalent of 18,000 lines on the film. The present unfolding fiber-optics used to transfer the cathode-ray tube information provides an equivalent of approximately 7500 lines on the film. A lens system (recorder No. 4, about completed) could provide a greater number of lines but would require two cathode-ray tubes and lens systems to approach the desired 18,000 lines. In addition, the lens system would provide a much lower equivalent light to the film. This would require a different film and modified processing techniques. A third approach to the solution would use a two tube system using fiber-optic faceplates and short fiber-optic extensions. This system could probably provide the 18,000 lines equivalent image.

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- d. Correlator. The present image reconstruction equipment can be made to provide approximately a ten-foot cell resolution. This can be provided by using a narrower slit-width and a narrower bandwidth of the wavelength filter. Additional time would be required in the reconstruction process if these changes were to be introduced.

3. It is apparent that the present system configuration is not able to provide a six-foot cell resolution. Whereas the resolution figure is probably closer to a 25-foot cell it can probably be reduced to about 15 feet as a result of tightening up the present configuration. To reach the initial six-foot goal will require advances in several areas that cannot be realized by engineering improvements. If a larger cell-resolution is considered acceptable at this stage of the program, then the flight-test and processing programs can be continued to determine system shortcomings and to provide corrections. A relaxation of the resolution figure will enable an increase in effective transmitter radiated power with a consequent increase in signal-to-noise which would be of great value during the flight-test program.

4. Representatives of [REDACTED] and TSD/SB discussed the preceding points in detail during a two-day meeting. A recommendation from the meeting will be made by the contractors to relax the resolution requirement so that the flight test and processing programs may be continued to gain system performance data and to enable improvements to be evaluated as development proceeds.

Chief
TSD/Systems Branch

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Antenna installation

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TRANSMITTAL SLIP		DATE: 19 June 62
TO: Special Asst/Tech Analysis		
ROOM NO. 6B44	BUILDING HQS	
REMARKS:		
FROM: C/TSD/SB		
ROOM NO.	BUILDING	EXTENSION 3337
FORM NO. 241 1 FEB 55 REPLACES FORM 36-8 WHICH MAY BE USED. GPO : 1957—O-439445 (47)		